FRD ACTIVITIES REPORT
April - June 2008

NOAA Field Research Division Awarded 2007 NOAA Bronze Medal

On April 17, the NOAA Field Research Division was awarded the 2007 NOAA Bronze Medal Award. Kirk Clawson, Director of FRD was on hand in Washington, D.C., to receive the award for the division. This award is given within NOAA to individuals or organizations that have excelled in research or operational support throughout the year. FRD was selected "for preeminent research on atmospheric observation technologies which has resulted in addressing issues of important national significance, including homeland security, hurricanes and air quality."

FRD has recently assisted the U.S. Department of Homeland Security in understanding atmospheric dispersion of chemical, biological, and nuclear agents in densely populated urban areas. Since 2000, they have participated in Operation Pentagon Shield and several other Homeland Security atmospheric tracer studies conducted in Salt Lake City, Oklahoma City, and Midtown Manhattan. These studies will help emergency personnel respond correctly in the event of a terrorist attack.

Other scientists at FRD study hurricanes. Special high-wind meteorological probes are in development at FRD and have been placed in the path of the eye of hurricanes as they came onshore. These prototype probes measured both wind speed and wind gusts (turbulence) that together cause the damage to buildings during a hurricane. The results will help engineers determine the design requirements for buildings to be able to withstand hurricane force winds.

The NOAA Smart Balloon, yet another device that was developed at FRD, has been instrumental in the success of numerous air quality studies. The NOAA Smart Balloon is an unmanned, autonomous, 10-ft diameter balloon that contains miniaturized lightweight sensors that continuously monitor and report air quality and weather conditions. In one recent study, the Smart Balloon was able to measure ozone as it crossed the entire Atlantic Ocean from Long Island, New York to the African Coast of Morocco. The data from the Smart Balloon are now being incorporated into air quality and climate change models.

FRD continues to maintain a network of 34 weather stations across Southeast Idaho in partnership with the U.S. Department of Energy. Data collected from this network helps FRD meteorologists create weather forecasts and support emergency operations at the Idaho National Laboratory.

The Bronze Medal is the second distinguished award received by FRD scientists in the last few months. Randy Johnson received a U.S. Department of Commerce Silver Medal Award for his work on the Smart Balloon last November. The Silver Medal is the Dept. of Commerce second highest award possible. (Kirk.Clawson@noaa.gov)

RESEARCH PROGRAMS

Fast Response Analyzer Data System Upgrade

Completion of the data system upgrade is nearly complete with only labeling of the switches and connectors on the enclosures remaining. The systems have been assembled with new circuit boards and microcontrollers installed in the enclosure. Firmware has been installed, CompactFlash cards installed and tested, electronics and firmware debugged, and documentation for the system has been written. The labeling should be complete the end of this month and the data systems installed on the analyzers in preparation for the upcoming EPA project. (Roger.Carter@noaa.gov, Randy Johnson, Shane Beard)

Low Cost Tracer Detector

A production version of the "X6" low cost detector has been completed and tested. Performance is similar to the experimental prototype, but not as good as was hoped for. Current efforts are focusing on a design for circuit boards and field deployable enclosures and on power supplies for the detector. However, design of a complete analyzer has been stalled while waiting for components. Two analyzer designs are under consideration. One is to use a semipermeable membrane to reduce oxygen and water concentrations in the sample stream. However, the semipermeable membrane that was promised to arrive in mid May has not arrived yet. It is now promised to arrive in early July. If the membrane does not work adequately, the second option is to use a more complicated hydrogen/oxygen reaction followed by a dryer to reduce the oxygen in the sample stream. Hopefully, testing will began soon on the membrane option. (Roger.Carter@noaa.gov, Randy Johnson, Shane Beard)

EPA Roadway Toxics Tracer Study

Discussions on the EPA Roadway Toxics Tracer Study with our colleagues in our sister division, Atmospheric Sciences and Modeling Division have been occurring on a bi-weekly basis this quarter. After much discussion about the unsuitability of the proposed Las Vegas test site for conducting a useful atmospheric tracer experiment, we proposed that the study be conducted here in Idaho near our office facility. We proposed using baled straw to construct a cheap imitation sound barrier from which we could then determine the dispersion characteristics. The data would

be used to improve roadway dispersion modeling in AERMOD. The proposal was accepted and we are making plans to conduct the experiment at the INL sometime this coming autumn. However, planning and design work have taken a slow-track until the funding proposal actually arrives from EPA (Kirk.Clawson@noaa.gov, Richard Eckman).

Work is underway on preparing the bag sampler tracer analysis facility for the pending roadway study. So far this has primarily involved the conditioning and tuning of the gas chromatographs for sulfur hexafluoride analysis, evaluating instrument limits of detection, checking for and replacing leaky bags as needed, and checking for degraded tubing. An inventory of calibration gases has been completed and inventories of other long lead time supplies that will be needed for the project are in process. (Dennis.Finn@noaa.gov, Roger Carter, Jason Rich)

ET Probe

All the effort related to the ET probes has been related to obtaining follow-on funding. Fiscal year 2008 was the first in which the probes had a shot at NOAA funding through PPBES. However, most of the NOAA hurricane research effort has been refocused on modeling improvements. The ET probe program is therefore back to its origins in pursuing external sources of funding. For example, the insurance industry has expressed some interest in using the probes to better understand the wind loadings that buildings experience in hurricanes, particularly the effect of wind gusts. (Richard.Eckman@noaa.gov)

NOAA/IDAHO NATIONAL LABORATORY METEOROLOGICAL RESEARCH PARTNERSHIP

Emergency Operations Center (EOC)

Team C attended a drill at the EOC on April 9, 2008. The drill centered on a fork lift accident that ruptured a drum, spilling waste to the ground. Team C provided a nowcast and short-term forecasting during the drill. (Neil.Hukari@noaa.gov and Roger Carter)

Team D attended a drill at the EOC on May 13, 2008. The drill centered on a fire at the Materials and Fuels Complex. "Canned" weather was used during the drill. Team D did run a plume projection using the NOAA model ALOHA. Nowcasts and short-term forecasts were also prepared during the drill. (Richard.Eckman@noaa.gov and Randy Johnson)

The drill conducted on 21 May was the biennial exercise for the Fort St. Vrain site in Colorado. The drill scenario featured a security incident with a disgruntled employee from the security staff

wounding one individual with gunfire and holding another individual hostage. It was later determined that explosive charges had also been placed on a sulfuric acid storage tank at the nearby power generation station. Furthermore, there was a large one ton chlorine storage tank near the sulfuric acid tank. The observed meteorology was inconsistent with the NWS forecast throughout the drill period. The observed winds over most of the area were generally light to very light and northerly, whereas the forecast called for southeasterly winds from 10-20 mph. To further complicate the matter, the lack of timely on-site meteorological observations contributed to some uncertainty. Consistently light, northerly winds were observed at the nearest meteorological station at Mead, about 3-4 miles south-southwest of the site. In contrast, the observed winds were often from the south and east at meteorological stations to the northeast of the site in the vicinity of Greeley, especially during the latter part of the drill. The discrepancy between the observed and forecast meteorology never became an issue because the security issue was resolved. However, it would have been problematic if there had been a release of the chlorine or sulfuric acid. The discrepancy between observed and forecast winds would have affected any plume modeling using forecast meteorology (e.g. HySPLIT). Plume modeling was conducted by the EOC Assessment Specialist and FRD in anticipation of a possible worst case scenario involving breaching of the sulfuric acid and/or chlorine tanks. The worst case scenario was modeled by ALOHA and involved a rapid release of chlorine. A potentially hazardous zone up to 4 miles downwind was indicated in this scenario. (Dennis.Finn@noaa.gov and Kirk Clawson)

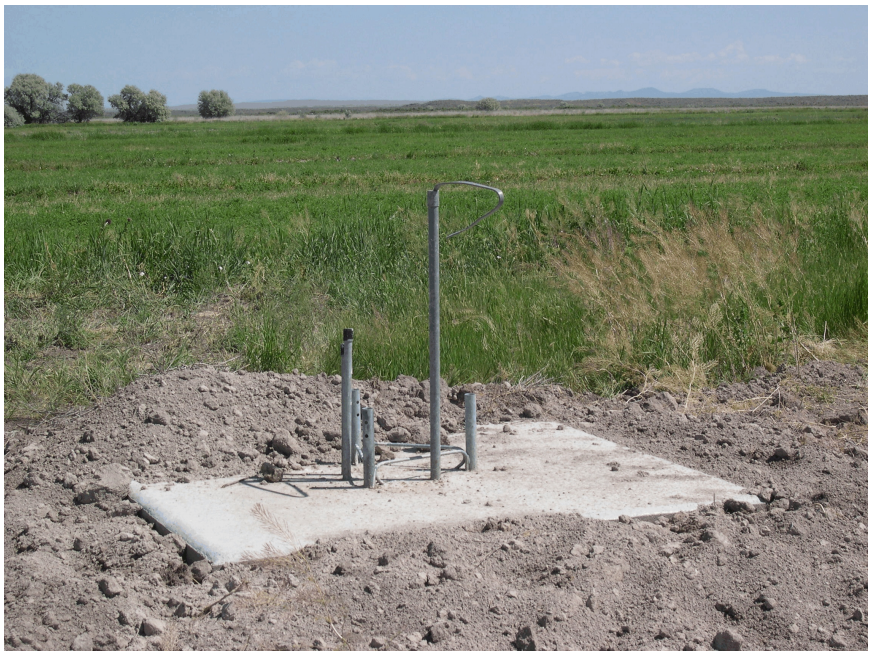
At the request of INL Emergency Planning, pre-planned (a.k.a. "canned") weather data have been prepared for a number of upcoming drills and exercises. These are designed to produce scenarios that exercise specific capabilities of the emergency response organizations. The weather data will be presented to participants on the usual weather display programs making the use of the pre-planned data as seamless as possible. (Roger.Carter@noaa.gov)

INL Weather Page

In-house testing of the new INL Weather Hazards Alert system has just about been completed. The new alert system will display the weather hazard on our NOAA/INL Weather Center (NIWC) home page in RSS format. It will also send an email to INL emergency planners, managers, and site workers of any potential weather hazard. The weather hazard will be designated as a statement or alert which is analogous to the NWS watch or warning. Implementation of the new system should begin in early July.

In addition to the new INL weather hazards alert system, other weather products have been added to the NIWC home page. Recent additions include 6-hour wind trends for each main INL facility and storm track information. Work is also being done on creating INL weather products for the PDA. (Jason.Rich@noaa.gov and Neil Hukari)

NOAA/INL Mesonet Stations



New Roberts Mesonet Station concrete pad.

Preparation of the new Roberts Mesonet tower site continued in earnest this quarter. The ground was excavated, forms installed, and concrete poured for the new tower pad. Electrical connections were also prepared. A crane will be rented early next month to move the tower from its present location 1/4 mile away and place it on its new foundation. The crane will also remove the old concrete pad leaving the site without a trace of our presence. During the move, of course, the station will be not be recording meteorological data. (Randy.Johnson@noaa.gov, Tom Strong, Shane Beard)

Transport and Dispersion Modeling

Work is in progress on implementing the AERMOD dispersion model for the INL site using data generated by the NOAA/INL Mesonet. Specifically, this calls for using onsite tower, sodar, and radar profiler meteorological measurements in lieu of NWS measurements made at considerable distances from the site. Some variance and covariance measurements made at an onsite flux station will also be included. Three programs are in development that together will QC the flux station data; calculate the necessary variances, covariances, fluxes, and surface layer parameters; and merge elements of that data stream with the Mesonet measurements into the AERMOD meteorological preprocessor AERMET. Other elements of the output from the programs processing the flux station data will also be ready and available for analyzing the energy balance and surface fluxes of carbon dioxide and water vapor over the INL sagebrush-steppe ecosystem. (Dennis.Finn@noaa.gov)

FRD continues to investigate various approaches that could be used to create realistic three-dimensional wind fields for the HYSPLIT dispersion model. HYSPLIT is currently designed to use wind fields extracted from numerical weather prediction models, but the forecast winds from

such models are often not accurate enough for use in an emergency situation involving a toxic release. FRD therefore needs a way to develop wind fields based on its extensive meteorological network in the region around INL. Other organizations within NOAA also appear to have an interest for such data-driven wind fields. Some tests were performed with a diagnostic wind-field model called CALMET. It could be adapted for use with HYSPLIT, but there is some anecdotal evidence that it produces unexpected results in certain situations. Right now, the thinking at FRD is that we will be better off developing something simple (e.g., interpolation between towers) now rather than spending additional time looking for a more sophisticated approach. We can then add more physically realistic features as time permits. (Richard.Eckman@noaa.gov)

OTHER ACTIVITIES

Outreach

FRD teamed up with Vernon Preston, Warning Coordination Manager for the NWS Forecast Office in Pocatello, Idaho to create "One NOAA" at the Idaho National Laboratory Safety Fair. The theme of the fair was called "You are the Key to a Safe Workplace." Weather safety tips, booklets, and our NOAA INL Weather Center web page, including the new 3-zone tabular forecast and INL weather hazards list, were shared with the participants. (Jason.Rich@noaa.gov)

Two FRD scientists participated in the "Ask a Scientist" program, in which local school students submit scientific questions that are answered by local scientists. The questions and answers are published in the *Post Register*, the local Idaho Falls newspaper, and are also available online at http://www.stoller-eser.com/NIE/questionarchive.asp. On April 22, Kirk Clawson answered the question "Are we still in a drought?" and on June 23, Rick Eckman answered the question "Why is global warming bad?" This supports the OAR director's outreach efforts. (Richard Eckman, 208-526-2740, and Kirk Clawson)

Rick Eckman is serving on the PhD committee for a graduate student in the Atmospheric Sciences department at the University of Wyoming. The committee met for the first time in April, when the student gave a presentation on his proposed thesis topic. To avoid travel costs, the meeting was attended through the video conference center at the Idaho National Laboratory. (Richard.Eckman@noaa.gov)

Papers

Eckman, R.M., 2008: Comments on "Dynamical Implication of Block Averaging" by Treviño and Andreas. *Bound.-Layer Meteor.* , **127**, 345-351.

Eckman, R. M., 2008: Comment on the reply of G. Trevino and E. A. Andreas. *Bound.-Layer Meteor.* , **127**, 357-358..

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, K.J. Allwine, and J.E. Flaherty, 2007: Analysis of Plume Dispersion in a Nocturnal Urban Boundary Layer in Complex Terrain, Salt Lake City, URBAN 2000. (Accepted at Journal of Applied Meteorology and Climatology)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, C. Biltoft, K.J. Allwine, J.E. Flaherty, and M.J. Leach, 2007: Analysis of Plume Dispersion, Decay, and Peak-to-Mean Excursions for Continuous Tracer Gas Releases in an Urban Core, Oklahoma City, JU2003. (In review at Boundary Layer Meteorology)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, C. Biltoft, K.J. Allwine, J.E. Flaherty, and M.J. Leach, 2007: Probability Density Functions and Peak-to-Mean Ratios for Tracer Plumes in an Urban Boundary Layer. (Returned from ARL Review)

Safety

At the April staff meeting, FRD employees watched a video on compressed gas cylinder safety by Westcott Communication, Inc.

"Electrical Hazards & Common Mistakes," by Industrial Training Systems, was presented at the May staff meeting.

Bradley Snedden, disease & injury prevention coordinator for the Division of Occupational Medicine at the INL, gave a refresher course on the Body Blue Print at our May staff meeting. Many FRD employees are stretching and strengthening as a group both mid-morning and mid-afternoon using the Body Blue Print program. This effort is helping with balance, endurance, and morale.

On June 19th, the office staff participated in NOAA's Safety Month with the theme of "Spring Housecleaning." The warehouse was the target of the cleanup effort, and many unused items were either discarded or identified for excess, as appropriate.

Travel

Dennis Finn to Pullman, WA, April 5-8, to give a Graduate Student Seminar presentation at Washington State University.

Dennis Finn to Boise, ID, April 10th, to give a Graduate Student Seminar presentation at Boise State University and to discuss scientific collaboration with the State of Idaho Dept. of Environmental Quality and the U.S. Bureau of Land Management.

Kirk Clawson to Washington, DC, April 17-20, to attend the NOAA Awards Ceremony.

Kirk Clawson and Richard Eckman to LasVegas, NV, April 21-23, to attend the ARL Division Director's Meeting.

Jason Rich to Silver Spring, MD, April 28 - May 1, to attend the HySPLIT training workshop.

Kirk Clawson to Reston, VA, May 4-12, to attend the U.S. DOE sponsored EMI-SIG 2008 Annual Meeting.

Donna Harris to Kansas City, MO, June 23-27, to attend the OAR Management Conference.

Training

The entire FRD staff completed the on-line 2008 NOAA Safety and Environmental Compliance Course.

The entire FRD staff completed the mandatory on-line FY2008 NOAA Information Technology Security Awareness Course.

Shane Beard and Tom Strong completed the GSA on-line Defensive Driving Training.

On June 10, 2008, Kirk Clawson and Donna Harris attended a Interpersonal Communication brown bag session provided by INL.

Miscellaneous

Keith Turbit, Security Specialist at the Mountain Region Security Office in Boulder, CO, performed an anti-terrorism security Risk Assessment for FRD. We have begun to implement the recommendations.

FRD was featured in the first ever OAR EEO Newsletter for EEO/Diversity activities. The article described an exercise at FRD where employees simulated physical disabilities and then attempted to accomplish their normal work load. This activity gave employees a greater appreciation for those who manage physical disabilities in day-to-day work environments.